ENTOMOLOGY

Title: **Effect of Clover-Mist Fire on Selected Biting Fly Populations and Cytogenetics of Western Black Fly Species**

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Objectives: 1.) To sample selected large and small streams for selected taxa of black flies as part of a treatment of the fauna of North America. 2.) To process samples using cytogenetic techniques for analyzing polytene salivary chromosomes to resolve species complexes of western black flies. 3.) To examine the impact of the Clover-Mist fires on the populations of Tabanidae in the Lamar River Drainage and of Rhagionidae in the Miller Creek Drainage to determine the effect of fire on host-seeking behavior of these flies.

Findings: Work on this project was completed in 1996. No further collections have been made since then. A volume on the black flies of North America is scheduled to be published late in 1998 and will incorporate information from this project. This project is now completed.

Title: **Elevational Distribution of Mosquito Species**

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Additional Investigators: J. E. Lloyd, J. L. Littlefield

Objectives: To examine the distributions of mosquitoes of the genus *Aedes* (Diptera: Culicidae) with

regard to physical environmental variables (elevation, date, water temperature, pH) and biotic variables (habitat). To create a predictive system for determination of mosquito communities in pools based on the above information.

Findings: I have not taken specimens from the park for several years. Several of the species present in the area are confined to specific elevational intervals (i.e., below 1,500 m or 2,000 m) or to certain time periods within the year. The presence of some species is also strongly correlated with the habitat of the pools, such as shading by coniferous trees or open with grass. Although the temperature of the water and the pH do help determine which species may be present, these are not strong predictors unless they are taken in context with the other variables. There are two additional variables that can add weight to predictions of the mosquito community, which are larval density (some species are not found in samples with high densities), and which of the other species are present (there are at least 25 species of *Aedes* present in the park). When taken as a coherent whole, the presence or absence of about 15 species can be fairly accurately predicted. Specimens of each species will be deposited in the MSU-Bozeman entomology collections.

Title: **Butterflies of Yellowstone and Grand Teton Parks (also Odonata)**

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Additional Investigator: Ms. Mardell Oleta Moore

Objectives: To produce field guides about the insects of Yellowstone and Grand Teton National Parks. Photographs need to be taken of all species in the parks. Data & photos only need to be obtained. No specimens are collected. All specimens are safely netted, photographed, and released alive in the area of the park where they were discovered by the researchers.

Findings: In 1997, several activities were accomplished. We took slide photographs of the entire Dragonfly collection at the Albright Museum in Mammoth. An entire set of the 34 slides was sent and donated to Museum Curator Susan Kraft. Slide photographs of at least 15 different species of dragonflies were taken in the field during 1997. Twenty slides of butterflies were taken in the field during 1997. Work continues on preparing the text and photos for the field guide to butterflies.

In 1998, ten species of dragonflies were successfully photographed for field guides. Four species of damselflies were also photographed. A diptera (fly) was photographed pollinating the sand verbena. Copies of all prints were given to the park's botanist for the record. While the researchers and park

botanist believe this is not the only pollinator, it is the first time any pollinator has been seen and captured on film.

Title: **The Mosquitoes of Yellowstone National Park: A Study on Biology, Behavior and Distribution**

Principal Investigator: Dr. Lewis T. Nielsen
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Objectives: A continuing study of the mosquitoes of Yellowstone National Park concerning species present, their distribution, biology, and behavior.

Findings: Final collections were made in May and June of 1994. It appears that mosquitoes which were reduced significantly in number and species in the study areas during the 1990 season made a steady comeback, and by the time of the 1994 collections, were back to pre-fire levels. It should be noted that populations of mosquitoes in the park normally fluctuate in response to temperature and amounts of yearly precipitation. Low levels of mosquitoes in the park have occurred in the past during very warm spring and early summer weather after lower than normal precipitation, i.e., larval habitats dry up before mosquitoes complete development to adults. It appears that fires do not have a long-term affect on mosquito numbers, but if the habitat is altered, such as by removal of shade, species competition may change.

A detailed report on Yellowstone mosquitoes was published in the *Journal of the American Mosquito Control Association*, 12(4): 695-700, 1996. Collections are held in the University of Utah Biology Department.

Title: **Gypsy Moth Survey**

Principal Investigator: Mr. Tom Olliff
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Additional Investigators: Carol Randall

Objectives: To detect the presence of alien gypsy moths in Yellowstone National Park.

Findings: In 1998, 73 monitoring traps were placed parkwide. An additional 16 delimitation traps were placed in the Mammoth area, since 2 moths were trapped in the Mammoth Campground in 1997. All traps were installed by June 20 and were removed by October 15. One trap, located in the Lake developed area, caught a gypsy moth. Delimitation in the Lake area will be conducted in 1999.

Title: **Community Position and Pattern along a Continuous Thermal Gradient: Physical and Biological Constraints**

Principal Investigator: Dr. Richard Wiegert

See Ecology

Title: **Respiratory Physiology and Habitat Selection in Thermophilic Aquatic Insects.**

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Objectives: To understand respiratory physiology and habitat selection decisions in thermophilic aquatic insects, including water scavenger beetles (Coleoptera: Hydrophilidae), and both adult and nymphal stages of dragonflies and damselflies (Odonata).

Findings: Odonate niads from thermal pools were found to exhibit thermal preference in the laboratory. Hydrophilid respiratory complex (plastron + macroplastron, or bubble) functions primarily as an oxygen reservoir at water temperatures greater than ca. 5 degrees C. Future research will investigate: 1.) The degree to which the respiratory complex function as a physical gill at low water temperatures (ca. T_w = 0 to 5.0 C); 2.) The degree to which adult male dragonflies exhibit thermal preference in controlling oviposition territories in thermally variable environments (e.g., Firehole River study site); and 3.) Development rates of odonate niads as a function of water temperature and dissolved oxygen tension will be investigated.

Findings to date provide the basis for two NSF proposals to support continuing research. One was submitted in fall 1998, and the other will be submitted in fall 1999 following field work at Yellowstone during summer 1999.